

## Historic, archived document

Do not assume content reflects current  
scientific knowledge, policies, or practices



# Constructing Roof Trusses

Roof trusses are multi-triangle structures used in place of the rafter and joist system. They offer these advantages for both farm buildings and houses:

## Better Space Utilization

No posts or columns obstruct living or working areas. Room partitions can be rearranged without impairing roof strength.

## Easier Construction

Roof trusses can be built on the ground and raised into place. This reduces climbing and scaffold work. Ceilings can be attached against bottom chords of trusses before room partitions are installed—thus avoiding much cutting, fitting, and framing otherwise necessary.

## Greater Strength

Properly designed and constructed trusses carry a greater roof load using less material than the rafter and joist system.

A roof truss consists of upper compression members and lower chords (or tension members) connected by a system of internal braces. Its design directs the weight of the roof and other roof loads downwards rather than outwards, thereby eliminating the outward stress against the walls.

Commercial truss factories produce trusses for a variety of roof pitches (slopes), loads, and widths. A ready-built truss should not be purchased unless it is made from an engineered design and has a certificate guaranteeing its designed load capacity.

Roof trusses can also be constructed on a "do-it-yourself" basis. They will be less expensive than the commercial variety and just as reliable provided that appropriate truss designs are carefully followed.

Do not build trusses too flexible or too heavy to lift into place with available labor and equipment.

Factory-made "prong-type" gussets (or gang nails) can be fastened onto the truss with portable hydraulic or electric presses.

Wood or pre-punched metal gussets can be hand nailed. **Take no shortcuts in nailing requirements.** Engineered truss designs will specify proper arrangement, size, and number of nails for each joint in the truss.

Glue can be used to reduce the number of nails necessary while increasing the strength of the joint. However, the effects of moisture and temperature can make the critical gluing needed in truss construction a sticky business for the non-professional. Casein glues are highly mold and water resistant, but not waterproof. They are adequate for most roof trusses if the joints stay dry for the life of the truss. Resorcinol resin glues are waterproof and should be used for any joints exposed to high moisture conditions.

Construction procedures described on this Agriculture Information Poster are intended for roof trusses with spans up to thirty feet. Suggested materials and proportions are common for most roof trusses up to that size. Individual steps can be varied to meet specific design requirements. Use only professionally engineered roof truss designs.

## MATERIALS NEEDED

### LUMBER:

**Truss Chords**—2 x 4 construction grade timbers stress rated at 1500 psi with 19 percent maximum moisture content.

**Interior Braces (Webbing)**—1 x 6 with 19 percent maximum moisture content.

**Gusset Plates**—½-inch plywood marked by recognized grading association. Exterior type CC or CD grade is recommended. Plywood should conform to all requirements for its type as specified in U.S. Product Standard 1.

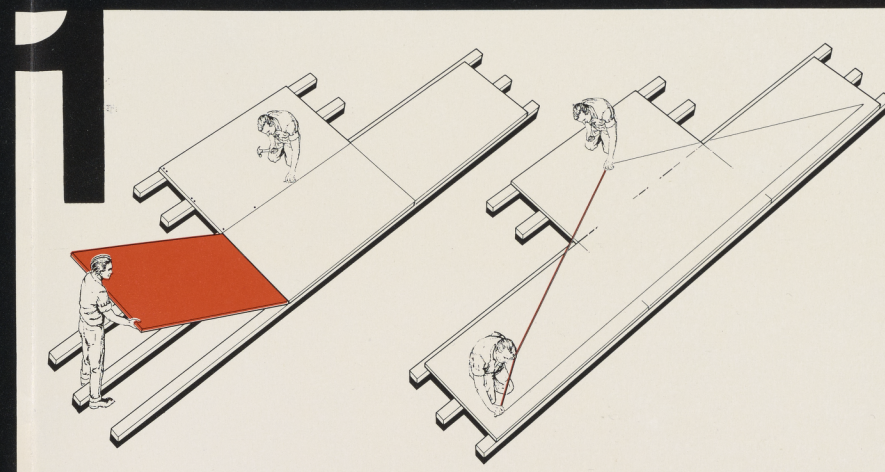
### NAILS OR STAPLES:

6d nails for gusset plates; 8d for interior braces (webbing). Equivalent size staples. Quantity at each joint depends on overall size of truss. Glue can reduce amount needed. Some truss designs require glue at some or all joint locations (see step 4).

### GLUE:

Casein or Resorcinol Resin, depending on climate and moisture conditions.

Engineered Truss Designs and nailing specifications, plus information on construction glues and gluing techniques, are available from USDA in Correspondence Aid H-14: "Constructing Roof Trusses—Supplement to Agriculture Information Poster #2." Write Office of Governmental and Public Affairs, USDA, Washington, D. C. 20250.

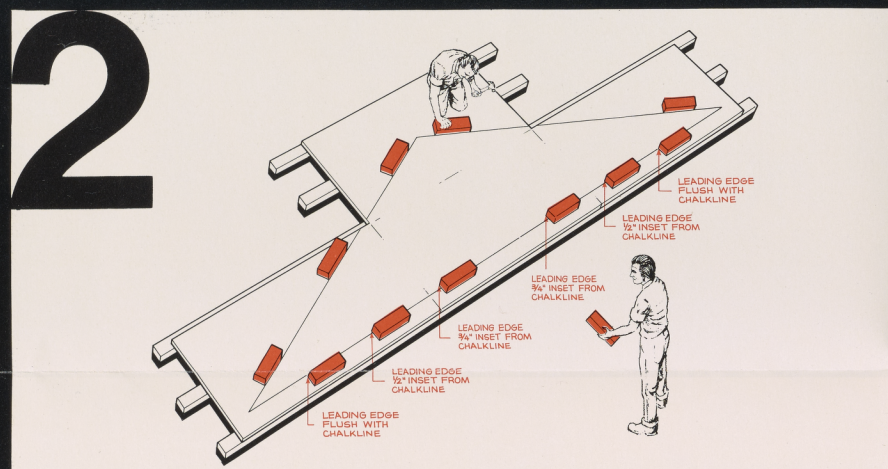


## Construct a Working Deck

Lay plywood sheets on 2 x 4's and nail down. 4 x 8 x ½" sheets are recommended. Deck must be firm, and large enough to accommodate entire truss and construction frame. Allow 2 x 4's to extend beyond deck so that additional plywood sheets can be added if necessary.

Outline truss perimeter on deck. Proceed according to outside dimensions of truss design.

Mark bottom edge of lower chord and top edge of both upper chords. Striking a chalkline is easier than using a straight-edge.



## Nail Down Bumper Blocks

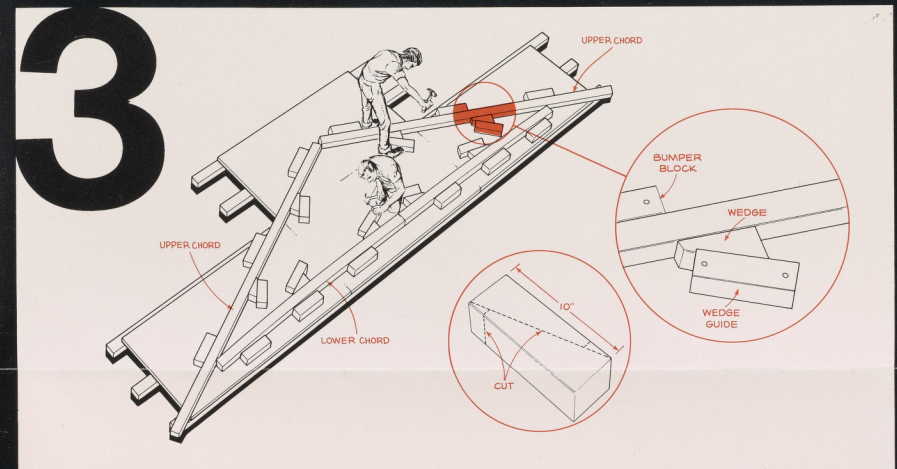
Saw twelve short lengths of 2 x 4. Position six along lower-chord chalkline, and three along each upper-chord chalkline. Space symmetrically, and no closer than one foot from either end of truss outline.

For upper chords, bumper-blocks are nailed down with their inside edge flush against chalkline.

The lower chord must have a camber, or arch. Align intermediate and middle bumper-blocks in-

ward of chalkline as illustrated. Leave a 4-foot separation between middle blocks.

Once nailed to working deck, the bumper-blocks need not be removed or reset until all trusses of the same size are finished.



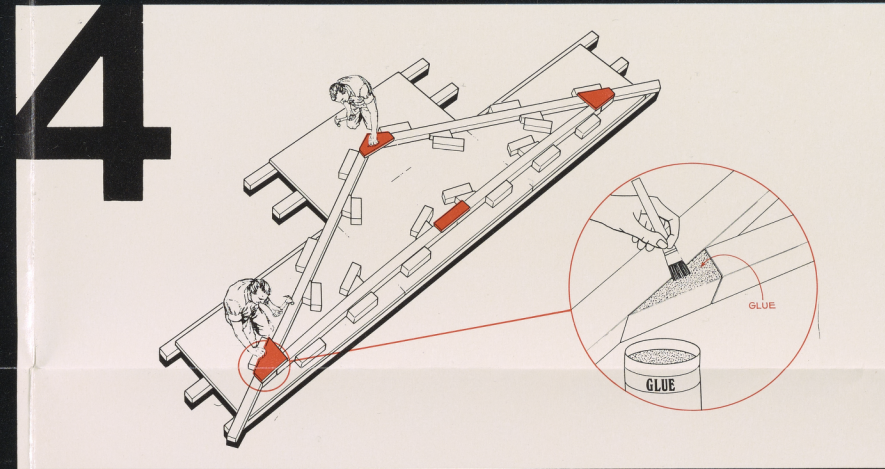
## Nail Down Wedging Guides

After chords for first truss are placed against bumper-blocks, set wedging-guides along inside of each chord. Position each wedging-guide to form an angle that matches wedge. "Inward end" of guide should be about 1½ inches from chord. Once nailed to working deck, wedging-guides need not be removed or reset.

Forcing wedges between guides and chords will straighten any warpage in chords and hold them

tight against bumper blocks while gussets and interior braces are being applied.

Two wedges can be cut from one short length of 2 x 4. (See insert in step 4 prior to cutting these wedges.) A blunted front makes it easier to knock them loose when the truss is ready to be removed from the deck.



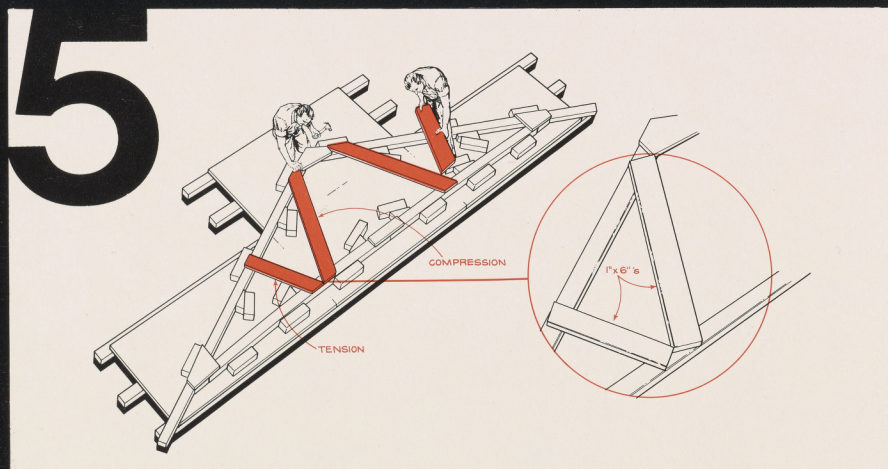
## Apply Gussets to Chords

Gussets can be made from ½-inch thick plywood. Use prescribed size and number of nails, and follow prescribed nail pattern at each gusset location. Avoid nailing in rows along wood grain. (Insert):

If ends of lower chord are not cut to fit against the upper chords, fill in gaps at joints with triangular blocks. Spread glue on top of triangular block before positioning gusset plate. (Glue is used be-

cause nails could split the block.)

An extra step can be saved by cutting wedges used in step 3 at same angle and size as these triangular "end-blocks." It may be necessary to shave about ¼-inch off width of "end-block" so that its bottom edge will be in line with bottom edge of lower chord.



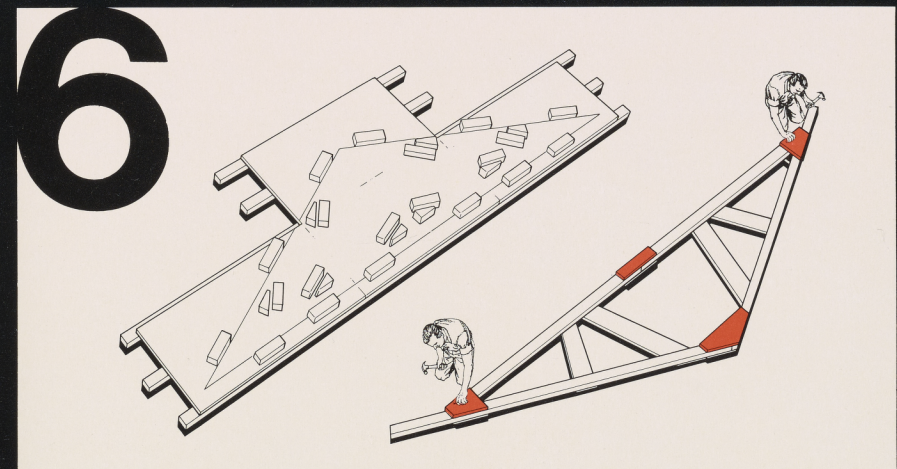
## Apply Interior Braces

Use 1 x 6 lumber. Connect peak of truss and middle points of upper chords with "one-third" points on lower chord. (Some truss designs may call for slightly different proportions.)

Mark connecting points on deck, or on bumper blocks, so that repeat measurements for each truss will not be necessary. Be sure to follow the prescribed nailing pattern.

## (Insert):

Interior braces can be installed without sawing their ends to fit flush alongside outer edge of chords. Since this procedure results in less nailing area per brace, the application of glue may be necessary under certain load conditions. Also, braces must extend to outside edges of each chord. If possible, allow compression brace to bear upon tension brace at some point.

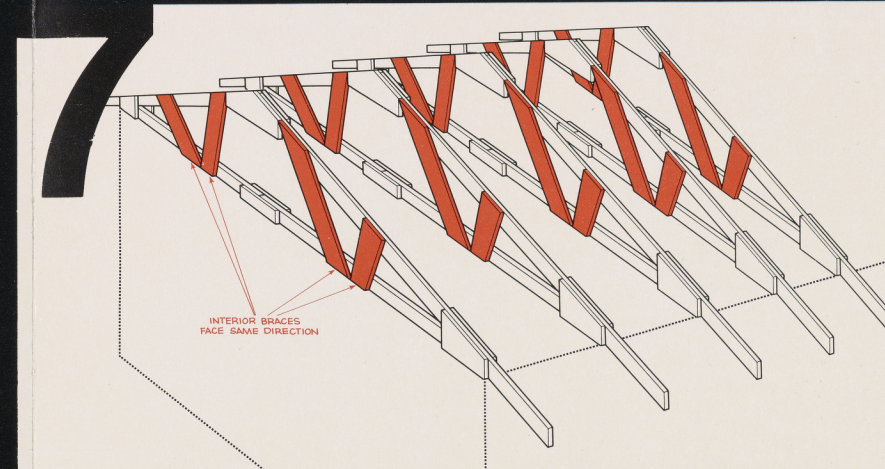


## Apply Gussets to Other Side of Truss

Knock wedges loose, then lift truss from deck and turn it over. Match all gussets already in place. Use same nailing pattern as before. If triangular "end-blocks" have been installed at ends of lower chord, again apply glue before positioning gusset plate (as in step 4).

Interior braces can also be applied to other side of truss for extra strength. This may be advisable in areas of heavy snowfall. Do not assume that

a second set of interior braces will give the truss significant strength for all loads. The increase in truss load capacity should be determined by a qualified architect or structural engineer.



## Note

When installing trusses, their "first sides"—the sides completed while trusses are still on construction deck—should all face the same direction. This will ensure a straight roof line, even if outline on deck was not entirely symmetrical.

If interior braces are applied to only one side of truss, they can be the guide for determining which

way truss should be facing. If braces are applied to both sides of truss, mark the truss on one side (the same side for each truss, of course) before stacking or installing it.

When lifting or carrying roof trusses, keep them as straight as possible.